

The PREFACE.

World, and for the discovery of many others hitherto unknown, and to make us, with the great Conqueror, to be affected that we have not yet overcome one World when there are so many others to be discovered, every considerable improvement of Telescopes or Microscopes producing new Worlds and Terra-Incognita's to our view.

The Glasses I used were of our English make, but though very good of the kind, yet far short of what might be expected, could we once find a way of making Glasses Elliptical, or of some more true shape; for though both Microscopes, and Telescopes, as they now are, will magnifie an Object about a thousand thousand times bigger then it appears to the naked eye; yet the Apertures of the Object-glasses are so very small, that very few Rays are admitted, and even of those few there are so many false, that the Object appears dark and indistinct: And indeed these inconveniences are such, as seem inseparable from Spherical Glasses, even when most exactly made; but the way we have hitherto made use of for that purpose is so imperfect, that there may be perhaps ten wrought before one be made tolerably good, and most of those ten perhaps every one differing in goodness one from another, which is an Argument, that the way hitherto used is, at least, very uncertain. So that these Glasses have a double defect; the one, that very few of them are exactly true wrought; the other, that even of those that are best among them, none will admit a sufficient number of Rayes to magnifie the Object beyond a determinate bigness. Against which Inconveniences the only Remedies I have hitherto met with are these.

First, for *Microscopes* (where the Object we view is near and within our power) the best way of making it appear bright in the Glass, is to cast a great quantity of light on it by means of *convex glasses*, for thereby, though the aperture be very small, yet there will throng in through it such multitudes, that an Object will by this means indure to be magnified as much again as it would be without it. The way for doing which is this. I make choice of some Room that has only one window open to the South, and at about three or four foot distance from this Window, on a Table, I place my *Microscope*, and then so place either a round Globe of Water, or a very deep clear *plano convex* Glass (whose convex side is turn'd towards the Window) that there is a great quantity of Rayes collected and thrown upon the Object: Or if the Sun shine, I place a small piece of oily Paper very near the Object, between that and the light; then with a good large Burning-Glass I so collect and throw the Rayes on the Paper, that there may be a very great quantity of light pass through it to the Object; yet I so proportion that light, that it may

The PREFACE

may not finge or burn the Paper. Instead of which I made use of a small piece of Looking-glass plate, or rather made rough by being rubb'd on a flat Tool with very fine sand, and then heat be leisurely cast on it, indure a much greater quantity of light, consequently very much augment a convenient light. The light of the Sun, or of a Window, may be so cast on the Object, that it is twice as light as it would otherwise be without it, and without the inconvenience of glaring, which the immediate light creates in most Objects; for by this means the light is so distributed, that all parts are alike inlightned; but when the immediate light falls on it, the reflexions from some few parts are so strong, that they obscure the appearance of all the other, and are themselves so bright, that they are of an equality of light, indistinct, and appear only radiant. But because the light of the Sun, and also that of a Window, is of an equal variation, and so many Objects cannot be viewed at once, to be thoroughly examin'd; besides that, oftentimes the light is so cloudy, that for many dayes together nothing can be seen, because also there are many Objects to be met with in the night, so conveniently be kept perhaps till the day, therefore I have used a sufficient quantity of light on an Object in the night, and have used this, Expedient.

I procur'd me a small Pedestal, such as is described in the first Scheme on the small Pillar A B, of which I made use of the Armes C D, which by means of the Screws E F, I could move the Pillar; on the undermost of these I plac'd a piece of Glass G, fill'd with exceeding clear Brine, stop't, inverted, and so visible in the Figure; out of the side of which I made an Arm H, with many joynts; to the end of which I made a *Convex glass* I, which by means of this Arm could be fixt in any posture. On the upper Arm was placed a Ball, which could be so mov'd upon the end of the Arm, as to give light through the Ball: By means of this Instrument, express'd in the Figure, with the small flame of a Lamp, I could give a convenient light on the Object as it will well in the Figure, constant, and to be had at any time. I found most representations of those small Objects I had occasion for.

None of all which ways (though much beyond the use of by any I know) do afford a sufficient help in the degree of magnifying, they leave us again in the lurch of a desirable, that some way were thought of for making such a Figure as would conveniently bear a large Aperture,

As for Telescopes, the only improvement they are capable of is in increasing of their length; for the Object being removed at a greater distance of giving it a greater light then it has; and the Aperture, the Glass must be ground of a very large